UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/684,520	10/15/2003	Mee-Ae Ryu	P56897	4180

7590 08/30/2007

Robert E. Bushnell
Suite 300
1522 K Street, N.W.
Washington, DC 20005

EXAMINER	
SANEI, HANA ASMAT	

ART UNIT	PAPER NUMBER
2879	

MAIL DATE	DELIVERY MODE
08/30/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

TH

Office Action Summary	Application No.	Applicant(s)	
	10/684,520	RYU ET AL.	
	Examiner	Art Unit	
	Hana A. Sanei	2879	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 May 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7 and 9-14* is/are pending in the application.

4a) Of the above claim(s) *18-23* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-6, 13* is/are rejected.

7)☒ Claim(s) *7-12 and 14* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 October 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

The Amendment, filed on 5/29/07, has been entered and acknowledged by the Examiner.

Cancellation of claims 8, 15-17, 24-41 has been entered.

Claims 1-7, 9-14 are pending in the instant application.

Election/Restrictions

Claims 18-23 withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected method of manufacturing electron emission sources, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 8/29/05.

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

1. Claims 1-2, 4-5 are rejected under 35 U.S.C. 102(b) as being anticipated by Yamazaki (JP 2002-100828 A).

Regarding Claim 1, Yamazaki teaches a first (21, see at least Figs. 1 &11a-b) and second substrates (11) provided opposing one another with a predetermined gap therebetween to form a vacuum assembly ("space 31 between panels is held at the high vacuum condition," [0020]); electron emission sources (375, "electron emission layer," [0064]) provided on the first (21); an electron emission inducing assembly (23, cathode electrode) inducing the emission of electrons (25, drawer electrode) from the electron emission sources; and an illuminating assembly (12, anode electrode & 13, fluorescent substance layer) provided on the other one of the first and second substrates (11) not including the electron emission sources being formed, the illuminating assembly realizing images by the emission of electrons from the electron emission sources (Fig. 1), with the electron emission sources (375) including a carbon nanotube layer (377, bleedoff layer such as carbon fiber and a carbon nanotube, [0065]) and a base layer (376, orientation member), said base layer having an outer surface that includes prominences and depressions (376 has "four guide pegs which use the top-most vertices of a tetrahedron as a head, respectively, and one guide peg is in the condition of having stood almost vertically to the tooth-back glass substrate 21," [0064]), the base layer (376) formed between the carbon nanotube layer (377, CNT) and the one of the first and second substrates (21) on which the electron emission sources are provided and having conductibility for applying a voltage ("conductive ingredients, such as ZnO," [0062]) to the carbon nanotube layer required for the emission of electrons, the carbon nanotube layer comprising a plurality of carbon nanotubes (377, Fig. 11b), and with the base layer having a predetermined thickness, and the carbon nanotube layer being

provided on the base layer in a state substantially un-mixed with the base layer (Fig. 11a begins unmixed → Fib. 11b yields an unmixed combination), the carbon nanotubes formed on both of the prominences and the depressions (emission layer 377 is constituted so that the CNTs may coil around the guide peg of the orientation layer 376, [0065]).

Regarding Claim 2, Yamazaki teaches cathode electrodes (23) formed in a stripe pattern (stripes of 23, see Fig. 3) on one of the first and second substrates (21) having the electron emission sources (375) provided, the electron emission sources being provided on an outer surface of the cathode electrodes; an insulating layer (24) formed covering the cathode electrodes at all areas except where the electron emission sources are formed (Fig. 3); and gate electrodes (25) formed on the insulating layer in a stripe pattern (stripe of 25) and in a direction substantially perpendicular to the cathode electrodes (23 being orthogonal to 25, Fig. 3), the gate electrodes including holes (26) for exposing the electron emission sources.

Regarding Claim 4, Yamazaki teaches an anode electrode (13) formed on the substrate (11) on which the electron emission sources are not formed; and phosphor layers (13) formed on an outer surface of the anode electrode.

Regarding Claim 5, Yamazaki the base layer (376, orientation member) includes an adhesive material having conductibility selected from the group consisting of silver, nickel, aluminum, gold, cobalt, and iron (Fe, [0064]).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki (JP 2002-100828 A) in view of Choi et al (US 2001/0006232 A1) of record.

Regarding Claim 3, Yamazaki teaches the invention set forth above (see rejection in Claim 3 above). Yamazaki fails to teach the gate electrodes being formed on one of the first and second substrates provided with the electron emission sources.

In the same field of endeavor, Choi teaches a field emission display (see at least Fig. 2) having gate electrodes (13, gates) formed in a stripe pattern (strip of 13, refer to Fig. 3) on one of the first and second substrates (11) provided with the electron emission sources (15, emission sources); an insulating layer (17, insulative layer) formed over an entire surface (insulative layer, 17, can be formed in a plane, [0030]) of one of the first and second substrates (11) provided with the electron emission sources and covering the gate electrodes; and cathode electrodes (12, cathodes) formed on the insulating layer in a stripe pattern (stripes of 12, Fig. 3) and in a direction substantially perpendicular to the gate electrodes (12 orthogonal to 13, see Fig. 3), the electron emission sources (15) being formed on an outer surface of the cathode electrodes in order to better facilitate the control of the emitted current from the electron emission

sources and additionally provide an easier way to coat the cathodes with the field emission material ([0006]).

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify the locations of the gate and cathode electrodes, as disclosed by Choi, in the FED of Yamazaki in order to better facilitate the control of the emitted current from the electron emission sources and additionally provide an easier way to coat the cathodes with the field emission material.

3. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki (JP 2002-100828 A) in view of Choi et al (US 6504292 B1).

Regarding Claim 6, Yamazaki teaches the invention set forth above (see rejection in Claim 1 above). Yamazaki fails to teach the base layer including a metal conductive material of copper.

In the same field of endeavor of base layers, Choi teaches that the base layer is provided as iron or copper, thus exemplifying recognized equivalent materials of the base layer in the art (Col. 4, lines 52-59). Choi teaches the suitability of using a base layer being provided as iron or copper in order to ensure the prevention of poorly conducting nanostructures (Col. 4, lines 52-55).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the base layer of Yamazaki as copper instead of as iron, since the selection of any of these known equivalents would be considered within the level of ordinary skill in the art as evidenced by Choi's teaching.

4. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Yamazaki (JP 2002-100828 A) in view of Lee et al (US 2002/0175618 A1) of record.

Regarding Claim 13, Yamazaki teaches the invention set forth above (see rejection in Claim 1 above). Yamazaki is silent the respective densities of the base layer and carbon nanotube layer.

In the same field of endeavor, Lee teaches a carbon nanotube density of the carbon nanotube layer being greater than the carbon nanotube density of the base layer, specifically for the carbon nanotube density of the carbon nanotube layer being 100 to 1,000,000 times a carbon nanotube density of the base layer (Page 3, Par [0018]) in order to improve electron emission characteristics.

Therefore, it would have been obvious to one of ordinary skill in the art, at the time of the invention, to modify the densities, as disclosed by Lee, in the field emission display of Yamazaki. Motivation to combine would be to improve electron emission characteristics.

Allowable Subject Matter

A. Claim 7 is objected as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including al of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for allowance:

The prior art of record teaches a field emission display comprising a first and second substrates provided opposing one another with a predetermined gap therebetween to form a vacuum assembly; electron emission sources provided on the

first; an electron emission inducing assembly inducing the emission of electrons from the electron emission sources; and an illuminating assembly provided on the other one of the first and second substrates not including the electron emission sources being formed, the illuminating assembly realizing images by the emission of electrons from the electron emission sources, with the electron emission sources including a carbon nanotube layer and a base layer, said base layer having an outer surface that includes prominences and depressions, the base layer formed between the carbon nanotube layer and the one of the first and second substrates on which the electron emission sources are provided and having conductibility for applying a voltage to the carbon nanotube layer required for the emission of electrons, the carbon nanotube layer comprising a plurality of carbon nanotubes, and with the base layer having a predetermined thickness, and the carbon nanotube layer being provided on the base layer in a state substantially un-mixed with the base layer, the carbon nanotubes formed on both of the prominences and the depressions.

However, the prior art of record neither shows nor suggests a motivation for the base layer comprising an adhesive material realized through a glass frit that selected from the group consisting of PbO, SiO2, Ba203, and a mixture thereof; and a metal conductive material selected from the group consisting of silver, copper, and aluminum as set forth in Claim 7.

B. Claims 9-10 are objected as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including al of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for allowance:

The prior art of record teaches a field emission display comprising a first and second substrates provided opposing one another with a predetermined gap therebetween to form a vacuum assembly; electron emission sources provided on the first; an electron emission inducing assembly inducing the emission of electrons from the electron emission sources; and an illuminating assembly provided on the other one of the first and second substrates not including the electron emission sources being formed, the illuminating assembly realizing images by the emission of electrons from the electron emission sources, with the electron emission sources including a carbon nanotube layer and a base layer, said base layer having an outer surface that includes prominences and depressions, the base layer formed between the carbon nanotube layer and the one of the first and second substrates on which the electron emission sources are provided and having conductibility for applying a voltage to the carbon nanotube layer required for the emission of electrons, the carbon nanotube layer comprising a plurality of carbon nanotubes, and with the base layer having a predetermined thickness, and the carbon nanotube layer being provided on the base layer in a state substantially un-mixed with the base layer, the carbon nanotubes formed on both of the prominences and the depressions.

However, the prior art of record neither shows nor suggests a motivation for the base layer including spherical particles with a diameter of 0.05 to 5 μm below the carbon nanotube layer as set forth in Claim 9.

Claim 10 is allowable because of their dependency status from claim 9.

C. Claims 11-12 are objected as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including al of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for allowance:

The prior art of record teaches a field emission display comprising a first and second substrates provided opposing one another with a predetermined gap therebetween to form a vacuum assembly; electron emission sources provided on the first; an electron emission inducing assembly inducing the emission of electrons from the electron emission sources; and an illuminating assembly provided on the other one of the first and second substrates not including the electron emission sources being formed, the illuminating assembly realizing images by the emission of electrons from the electron emission sources, with the electron emission sources including a carbon nanotube layer and a base layer, said base layer having an outer surface that includes prominences and depressions, the base layer formed between the carbon nanotube layer and the one of the first and second substrates on which the electron emission sources are provided and having conductibility for applying a voltage to the carbon nanotube layer required for the emission of electrons, the carbon nanotube layer comprising a plurality of carbon nanotubes, and with the base layer having a predetermined thickness, and the carbon nanotube layer being provided on the base layer in a state substantially un-mixed with the base layer, the carbon nanotubes formed on both of the prominences and the depressions.

However, the prior art of record neither shows nor suggests a motivation for a thin film formed between the base layer and the one of the first and second substrates, the thin film having prominences and depressions, the prominences of the thin film having 0.05 to 10 μm width, 0.01 to 5 μm depth and 1 to 20 μm intervals as set forth in Claim 11.

Claim 12 is allowable because of their dependency status from claim 11.

D. Claim 14 is objected as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including al of the limitations of the base claim and any intervening claims.

The following is an examiner's statement of reasons for allowance:

The prior art of record teaches a field emission display comprising a first and second substrates provided opposing one another with a predetermined gap therebetween to form a vacuum assembly; electron emission sources provided on the first; an electron emission inducing assembly inducing the emission of electrons from the electron emission sources; and an illuminating assembly provided on the other one of the first and second substrates not including the electron emission sources being formed, the illuminating assembly realizing images by the emission of electrons from the electron emission sources, with the electron emission sources including a carbon nanotube layer and a base layer, said base layer having an outer surface that includes prominences and depressions, the base layer formed between the carbon nanotube layer and the one of the first and second substrates on which the electron emission sources are provided and having conductibility for applying a voltage to the carbon

nanotube layer required for the emission of electrons, the carbon nanotube layer comprising a plurality of carbon nanotubes, and with the base layer having a predetermined thickness, and the carbon nanotube layer being provided on the base layer in a state substantially un-mixed with the base layer, the carbon nanotubes formed on both of the prominences and the depressions.

However, the prior art of record neither shows nor suggests a motivation for the base layer is formed at a thickness of 0.05 μm to 5 μm as set forth in Claim 14.

Other Prior Art Cited

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

US 2002/0070648 to Forsberg

US 633598 to Hsu et al

US 6417606 to Nakamoto et al

US 6541906 to Lee et al

US 6653366 to Imai et al

US 6028391 to Makishima

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Contact Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hana A. Sanei whose telephone number is (571)-272-8654. The examiner can normally be reached on Monday- Friday, 9 am - 5 pm. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nimeshkumar D. Patel can be reached on (571) 272-2457. The fax phone number for the organization where this application or proceeding is assigned is (571) 273-8300. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

HAS

Hana A. Sanei
Examiner

Joseph Williams
Primary Examiner